M E M O R A N D U M

DATE: May 5, 1976

TO: Charles Hitch

FROM: Eugene Seskin

SUBJECT: Lederberg Analysis

I am not on top of analyses in the nuclear safety area; however, as I see things there are at least two basic interrelated issues involved: (1) the valuation of health effects (including loss of life); and (2) the proper treatment of low probability-catastrophic events. First, I'll discuss these two issues in terms of avenues to explore that may be useful for a re-analysis. Then, I'll mention some questions I have with regard to the current analysis as presented in the attached article.

On the first issue, it occurs to me that it would be useful for Lederberg to see a copy of Chapter 10 of the Lave and Seskin manuscript. The chapter, entitled "The Benefits and Costs of Air Pollution Abatement," not only presents an example analogous to his concerns, but also it discusses many of the salient issues involved in the valuation of health effects (with references). If RFF has no objections, a draft of the chapter could be forwarded without delay. (I spoke with Lester Lave and he had no objections; in fact, he told me that he has corresponded with Lederberg in the past.) In addition, I think Lederberg could be referred to Raiffa and Schwartz and their attempts to grapple with the valuation-of-life issue for our NAS Panel. This may not be too fruitful at present since nothing is on paper and since I don't think either Raiffa or Schwartz has done previous work in the area. Finally, Lederberg's concerns relate directly to the Cambridge contingent (under Dorfman) and their attempts to handle the issue of discounting health effects. Although I am not sure how much progress has been made, a discussion between Dorfman and Lederberg could prove to be mutually beneficial.

Regarding the second issue, I find no evidence in the article that Lederberg had addressed the topic of low probability-catastrophic events. From my following of the issues involved in the safety of nuclear power generation, this is the most important concern, far outweighing any calculation of health disbenefits from background radiation. I suggest consultation with Toby Page (or Sharefkin or Hunter) about their latest thoughts in connection with their work on the environmental risk management monograph. I have heard both Page and Sharefkin use the issue of nuclear safety as a lucid example of the problems involved.

I am not in a position to comment meaningfully on quantification of genetic effects or cancer loads. However, leaving those estimates to the scrutiny of experts in the relevant fields, I have some comments and questions regarding Lederberg's method of monetizing the possible health impacts. (If you are interested in seeing his calculations in detail, I have reconstructed most of them.)

1. Medical expenditures are at best a lowest bound for the value of "health." At a minimum, forgone earnings should be added to them to provide more meaningful estimates. Psychic costs are still being neglected.

2. Since Lederberg's monetization is based on his assumptions, I must question the data on which two statements are founded.

   The statements are:

   a) that there are a million conceivably deferable deaths per year;

   b) that society might be willing to double health care expenditures in exchange for at least a 20 percent improvement in health care standards.

3. If one takes, as given, statement (b), this immediately implies that since background radiation is estimated to worsen health (in terms of gene mutation) by 0.2 percent, its health-decremental value is $800,000,000. (This is point (3) on p. 45 of the article.) I find the argument meaningless given the lack of support for his assumptions.

4. A more meaningful, albeit crude, procedure for monetizing the health effects would apply the 0.2 percent estimate to more defensible figures. For example, Dorothy Rice has new estimates on the cost of illness in the U.S. These combine direct medical costs with foregone earnings and can be used to provide a lower-bound estimate on health effects. In addition, a value of life figure of $200,000 has been brandished about in the literature and actually supported by several empirical studies; it could be used in the calculation (especially if Lederberg can distinguish between morbidity and mortality effects). One would then use the estimate of cancer loads and monetize it in the same manner. This calculation would then be added to the monetized disbenefits from gene mutation and the result should be better estimates than appear in the article.

5. Finally, it is not clear to me, with what Lederberg is comparing the health "disbenefit." Converting the estimate into per capita terms is not illuminating from the perspective of policy making. One is not interested in the marginal disbenefit per capita. Instead, one wants to know how the marginal benefits of a particular policy compare to the marginal costs of that policy.